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โดยกลไกออสโมติกและการแพร่



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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาเภสัชศาสตรมหาบัณฑิต

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ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

CONTROLLED RELEASE OF CHITOSAN FILM COATED TABLETS BY
OSMOTIC AND DIFFUSION MECHANISMS



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งานวิจัยนี้มุ่งที่จะนำสารไคโตแซนมาใช้เป็นส่วนประกอบหลักของฟิล์มเคลือบเม็ดยาในระบบนำส่งยาโพรพาราโนลอล ไฮโดรโครอไรด์ ออสโมติกปั๊ม โดยฟิล์มเคลือบเม็ดยานี้ประกอบด้วย ไคโตแซนอะซิเตด, แมกนีเซียม สเตียเรต, น้ำมันละหุ่ง และสปีริตลิเอน บลู จากการศึกษาพบว่าน้ำหนักโมเลกุลของไคโตแซนมีผลต่อการปลดปล่อยตัวยา โดยยาเม็ดที่เคลือบด้วยไคโตแซนน้ำหนักโมเลกุลต่ำให้ผลในการปลดปล่อยตัวยาช้ากว่ายาเม็ดที่เคลือบด้วยไคโตแซนน้ำหนักโมเลกุลสูง ดังนั้นจึงเลือกไคโตแซนชนิดโมเลกุลต่ำเป็นส่วนประกอบหลักในฟิล์มเคลือบเม็ดยาในการศึกษาในขั้นต่อไป การสัมผัสความร้อนที่อุณหภูมิ 60°C ความชื้นสัมพัทธ์ที่ 75% ของเม็ดยามีผลต่อการปลดปล่อยตัวยา เนื่องจากการเปลี่ยนแปลงไคโตแซนอะซิเตด ไปอยู่ในรูปสารไคดินซึ่งไม่ละลายน้ำ ดังนั้นอัตราการปลดปล่อยตัวยาจึงลดลงและเวลาที่ยาเริ่มถูกปลดปล่อยจึงนานขึ้นตามระยะเวลาที่เม็ดยาสัมผัสความร้อนขึ้น ช่อกนำส่งยาเป็นวิธีที่ใช้ในการลดเวลาที่เริ่มปลดปล่อยตัวยา และเพิ่มการปลดปล่อยตัวยา เมื่อยาเม็ดใช้เวลาในการสัมผัสความร้อนขึ้นนาน ฟิล์มเคลือบเม็ดยาจะมีความสมบูรณ์ ทนทาน แต่ความสามารถในการให้น้ำแพร่ผ่านฟิล์มจะลดลง ช่อกนำส่งยาจะมีความสำคัญต่อการปลดปล่อยตัวยาของยาเม็ด แต่ผลของความแตกต่างของขนาดช่อกนำส่งยาต่อการปลดปล่อยตัวยาไม่เด่นชัด การปลดปล่อยตัวยาในตัวยากลางการละลายที่มีค่าออสโมลาลิตีต่างกัน พบว่าการปลดปล่อยตัวยาลดลงเมื่อค่าออสโมลาลิตีในตัวยากลางการละลายเพิ่มขึ้น แสดงว่าความดันออสโมติกมีส่วนร่วมในการควบคุมการปลดปล่อยตัวยาของยาเม็ด การเพิ่มโซเดียมคลอไรด์ในยาเม็ดแกนมีผลลดการปลดปล่อยตัวยาลง ลักษณะการปลดปล่อยตัวยาสามารถอธิบายได้จากพฤติกรรมกรรมการแพร่ และกลไกออสโมติกปั๊ม

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KEY WORD: CHITOSAN / OSMOTIC PUMP / TABLET / FILM COATING / PROPRANOLOL HYDROCHLORIDE

WALAILAK NAMWIJITPHAN : CONTROLLED RELEASE OF CHITOSAN FILM COATED TABLETS BY OSMOTIC AND DIFFUSION MECHANISMS. THESIS ADVISOR : PROF. GARNPIMOL C. RITTHIDEJ, Ph.D., THESIS COADVISOR : JITTIMA CHATCHAWALSAISIN, Ph.D., 171 pp. ISBN 974-17-6344-1.

The purpose of this present study was to apply chitosan as a main component of film formation in propranolol hydrochloride osmotic pump device. The coated film consisted of chitosan acetate, magnesium stearate, castor oil and brilliant blue. Molecular weight of chitosan had an influence on drug release. The coated tablets with lower molecular weight of chitosan exhibited slower drug release than those with higher molecular weight. Thus, the lower molecular weight was chosen to apply as coating material for coated tablets. Moist heat treatment at 60°C 75%RH to the coated tablets was effective to prolong drug release, due to the thermally-induced conversion of a water-soluble chitosan acetate film into a water-insoluble chitin film. Therefore, prolongation of drug release and lag time depended on the interval of moist heat treatment. Having passageway was a method to decrease lag time and increase drug release. After long moist heat treatment, the coated film was integrity, durable but lower water permeability. Influence of passageway on drug release was also obtained, whereas the effect of the size of passageway on drug release was minute. Increasing the osmolality of dissolution medium led to a decrease in dissolution profile of treated tablets, indicating that osmotic pressure had an effect in the control of the release of propranolol hydrochloride. Incorporation of sodium chloride into core tablets further prolonged the drug release. The drug release characteristics could be explained in terms of the diffusion controlled and osmotically driven force.

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ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

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LIST OF ABBREVIATIONS

°C	degree Celsius (centigrade)
ANOVA	analysis of variance
cm	centimeter (s)
cm ⁻¹	per centimeter
CV	coefficient of variation
DI	deionized
DSC	differential scanning calorimetry
e.g.	example and other
et al	et alli and other
FT-IR	fourier transform infrared spectrophotometry
Fig.	figure
g	gram(s)
h	hour (s)
HCl	hydrochloric acid or hydrochloride
kp	kilopound (s)
M	molality
mcg	microgram (s)
min	minute (s)
ml	milliliter (s)
q.s.	make to volume
R ²	coefficient of determination
RH	relative humidity
rpm	revolution per minute
SD	standard deviation
SEM	scanning electron photomicrograph
UV	ultraviolet
UV-VIS	ultraviolet-visible
w/w	weight by weight
µg	microgram (s)
µm	micrometer (s)
%	percentage